

Flavor of Summer, Fall, and Winter Varieties of Apples Baked in Pies

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For pies, the flavor of summer varieties of apples was equal to or slightly superior to the flavor of fall and winter varieties. Calcium chloride, used to firm the softer varieties, did not affect their flavor.

The purpose of this study was to compare the flavor of summer, early fall, and winter varieties of apples when canned or frozen, and subsequently baked in pies. Calcium chloride was used to firm the softer varieties and maintain the desired texture during baking.

The use of calcium salts to improve the firmness of cooked apple slices (1, 3, 4, 5, 6, 9) has made possible the utilization of many summer varieties which would otherwise be too soft for canning or freezing. It is generally recognized that summer varieties of apples are rather tart and flavorful when used in home recipes (1, 2, 8). Their principal deficiency from a commercial processing standpoint is a tendency to become mushy when cooked. This deficiency may now be corrected by the application of dilute solutions of calcium salts.

Materials and Methods

Apples were purchased from a nearby commercial orchard as the different varieties were harvested. The fruit was allowed to ripen at room temperature until the pressure readings, as measured by a Magness-Taylor (7) instrument, corresponded to values given by Pfund (8) for optimum maturity of New York State apples. When properly ripened, the apples were placed in storage at 35° F. (1.5° C.) until used.

Green and overripe apples and those measuring less than 2 inches (5.1 cm.) in diameter were sorted out before the samples were taken for canning or freezing. All apples were peeled, cored, sliced in eighths or twelfths, depending on the size, and held in 1% NaCl until used. This holding time was limited to a minimum to prevent water-logging of the slices. The optimum amount of calcium chloride to be used with the softer varieties was determined in a preliminary test by the methods described in a previous publication (4).

For each canned sample, 450 gms. of apple slices were immersed in water or calcium chloride solution in a vacuum desiccator and held under 24-26 inches (61-66 cm.) of vacuum for 5 minutes to remove the air from the slices and to impregnate them with the solution. The slices were then heated to 190° F. (88° C.) in a minimum of tap water, drained, and packed into No. 2 lacquered cans containing 2 ounces (56.5 g.) of 50% sugar sirup. The cans were sealed, processed in a boiling water bath for 10 minutes, cooled to room temperature, and stored at 35° F. (1.5° C.).

Slices to be preserved by freezing were steam blanched for the minimum time required to prevent discoloration, 90 seconds in most instances, cooled in water or calcium chloride solution for 5 minutes, drained, and packed in cellophane bags with sugar. In 1947 the ratio of apples to sugar was 3:1; in 1948 it was either 9:1 or 5:1, depending on the acidity of the variety. The bags were sealed by heat, placed in boxes, and stored at -20° F. (-29° C.).

Preparation and Use of a Standard

The Baldwin variety was used as a standard reference sample because it is one of the better varieties for pies. A frozen sample was prepared for use with frozen slices, and a canned sample for comparing canned slices. Separate standards were prepared for use with the 1947 and 1948 lots of fruit. These standards were first scored by the taste panel, then used in each test at the previously determined score.

Procedure for Baking Apple Pies

Canned slices were held overnight at room temperature; the frozen slices were held overnight in the refrigerator at 35° F. (1.5° C.), then at room temperature for about an hour. All liquid was drained off both frozen and canned slices before the pie crust was filled, and 30-40 gm. of sugar was sprinkled over them. All spices were omitted to avoid masking the apple flavor. A top crust, in which were several holes, was placed on each pie. Four pies were placed on the shelves of a revolving oven preheated to 425° F. (218° C.). The pies were baked for 45 minutes at 425° F. (218° C.), then cooled for 2 to 4 hours. After the top crust was removed, the slices were scored for flavor.

Scoring of Apple Pies

A panel of 20 persons judged the pies in 1947, and 12 in 1948. Four to six pies were judged at each session. One pie in each group was prepared from the Baldwin standard. The panel rated for flavor on a scale of 10 to 1, 10 being best. The score assigned to the Baldwin standard (7 or 6) was the whole integer closest to the average flavor score, as determined in a preliminary test.

Discussion of Results

Table 1 shows the flavor scores for the 1947 samples. The varieties are grouped according to their harvest season in Pennsylvania. The data were analyzed statistically. The average standard error of all groups was used rather than the standard errors of specific group averages. On this basis, a difference of 1.1 between groups was significant (5% level) and a difference of 0.65 was slightly significant (20% level). Although

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TABLE 1
Flavor Scores of Pies Prepared from Canned and Frozen Apple Slices in 1947

Group	Variety	Frozen ^b		Canned ^b	
		Control	CaCl ₂ treated	Control	CaCl ₂ treated
Summer	Yellow Transparent.....	7.6	7.5	6.5	5.9
	Williams.....	5.9	6.6	6.8	6.9
	Rambo.....	6.1	6.8	6.7	6.4
	Gravenstein ^c	6.9	6.1	7.1	6.5
	Gravenstein ^c.....	....	....	7.3	7.2
	Ave.....	6.63 ± .39 ^d	6.75 ± .29	6.88 ± .14	6.58 ± .22
Fall	Wealthy.....	5.2	6.0	5.8	6.4
	McIntosh.....	5.9	6.3	6.5	....
	Grimes ^e	6.1	....	6.7	5.3
	Grimes ^e	5.2	5.4	4.5	4.4
	Jonathan.....	6.3	....	7.2	....
	Red Delicious.....	5.3	5.6	5.5	5.2
Winter	Ave.....	5.67 ± .18	5.83 ± .20	6.03 ± .40	5.33 ± .41
	Golden Delicious.....	5.1	....	4.8	....
	Stayman Winesap.....	6.2	6.5	7.6	7.4
	York Imperial.....	6.8	....	5.6	....
	Stark.....	6.4	....	4.7	....
	Baldwin ^e	7.0	....	7.0	....
	Ave.....	6.30 ± .33	....	5.94 ± .58	....
	Ave. of varieties treated with CaCl ₂	6.03 ± .27	6.31 ± .21	6.45 ± .30	6.16 ± .30

^b It is not possible to compare scores of canned samples with those of frozen samples because different standards were used for each.

^c Represents two lots of fruit of the same variety.

^d ± values = standard error of mean.

^e Baldwin used as a standard of comparison.

Ave. Difference required for significance (P = .05) between varieties = 1.1; between groups = 1.1.

the summer varieties as a group scored consistently higher in flavor than the other groups, the difference in average score was significant (>1.1) in only one instance (canned, calcium treated). This difference was probably exaggerated by the omission of two varieties not requiring calcium. The difference between the summer and winter varieties (frozen) was not significant. It was not possible to compare scores of canned samples with those of frozen samples because different standards were used for each. The average scores of the calcium-treated samples and the corresponding controls showed no true difference.

The flavor scores for 1948 (Table 2) showed much smaller differences between groups, none of the differences being significant. Again the summer varieties (frozen) had the highest scores. Among the canned

samples, the group averages were nearly identical. The calcium treatment did not affect the flavor of either the frozen or the canned slices.

There was considerable variation in the scores of the individual varieties from season to season. This may have been a seasonal effect, a sampling variation, or both. The four summer varieties had high scores both seasons. Gravenstein and Yellow Transparent were the best of this group. Of the fall varieties, Jonathan and McIntosh were the best and Red Delicious the poorest. In the winter group Baldwin and Stayman winesap were good, and Stark and Golden Delicious were poor.

The maturity of the apples when picked has a marked effect on flavor. This is especially true of the winter varieties which are often picked rather immature to

TABLE 2
Flavor Scores of Pies Prepared from Canned and Frozen Apple Slices in 1948

Group	Variety	Frozen ^f		Canned ^f	
		Control	CaCl ₂ treated	Control	CaCl ₂ treated
Summer	Yellow Transparent.....	6.3	6.3	5.0	5.0
	Williams.....	6.0	6.9	5.4	5.7
	Rambo.....	6.5	6.8	5.5	5.4
	Gravenstein.....	6.6	6.3	5.6	5.7
	Ave.....	6.35 ± .13 ^g	6.58 ± .16	5.38 ± .13	5.45 ± .20
Fall	Dutchess.....	6.3	5.5	4.4	4.9
	Wealthy.....	6.8	5.2	5.7	6.1
	McIntosh.....	6.4	6.9	5.4	5.9
	Grimes.....	4.7	5.0	5.9	5.5
	Jonathan.....	6.7	....	5.6	....
	Red Delicious.....	....	....	4.7	5.1
Winter	Ave.....	6.18 ± .38	5.65 ± .43	5.28 ± .24	5.50 ± .33
	Golden Delicious.....	5.6	6.3	5.1	5.0
	Stayman Winesap.....	6.9	....	6.2	....
	York Imperial.....	5.4	....	6.3	....
	Stark.....	4.9	....	5.1	....
	Baldwin ^h	7.0	....	6.0	....
	Ave.....	5.96 ± .40	....	5.74 ± .27	....
	Ave. of 10 varieties treated with CaCl ₂	6.13 ± .19	6.13 ± .22	5.27 ± .15	5.43 ± .13

lengthen their storage life. The Golden Delicious apples used in this study were rather immature when picked.

The most important facts brought out in this study were the high flavor scores of pies baked from summer varieties of apples. The use of calcium chloride to firm these varieties did not affect the flavor.

Summary

Fifteen varieties of summer, fall, and winter apples were preserved by canning or freezing and scored for flavor when baked into pies. The softer varieties were treated with appropriate amounts of calcium chloride to preserve their texture.

Results of two seasons' tests show that the summer varieties of apples were equal or superior to the winter and fall varieties for pies. Calcium chloride, necessary to firm the softer varieties, did not affect the flavor.

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